

Amendment of Claims
under Article 34

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C L A I M S

1. (amended) A feedback control method of performing
disturbance recovery control by giving a manipulated variable to a controlled system so as to make a controlled variable recover to a set point at the time of application of a disturbance, characterized by comprising:
 - the step of dividing a response process of disturbance recovery control into three stages including a follow-up phase, a convergence phase, and a stable phase;
 - the first phase switching step of switching to the follow-up phase at a disturbance application detection time point as a start time point of the follow-up phase;
 - the follow-up phase manipulated variable determination step of continuously outputting a manipulated variable which makes the controlled variable follow up the set point in the follow-up phase;
 - the second phase switching step of switching to the convergence phase at a disturbance recovery control elapsed time point, as a start time point of the convergence phase, at which the controlled variable does not exceed the set point in the follow-up phase;
 - the convergence phase manipulated variable determination step of continuously outputting a

26 manipulated variable which makes the controlled variable
27 converge near the set point in the convergence phase so
28 as to prevent a control response waveform from being
29 disturbed before and after a switching time point
30 between the follow-up phase and the stable phase;

31 the third phase switching step of switching to
32 the stable phase at a time point, as a start time point
33 of the stable phase, at which a preset state is reached
34 in the convergence phase; and

35 the stable phase manipulated variable
36 determination step of continuously outputting a
37 manipulated variable which makes the controlled variable
38 stable at the set point in the stable phase.

2. A feedback control method according to
2 claim 1, characterized in that the first phase switching
3 step comprises the step of setting a time point, as the
4 start time point of the follow-up phase, at which it is
5 confirmed on the basis of a deviation between a set
6 point and a controlled variable that a disturbance has
7 been applied.

3. A feedback control method according to
2 claim 1, characterized in that the first phase switching
3 step comprises the step of setting a time point, as the
4 start time point of the follow-up phase, at which a
5 phase switching signal is input from an external unit
6 which notifies application of a disturbance.

4. A feedback control method according to

2 claim 1, characterized in that the second phase
3 switching step comprises the step of calculating a
4 predicted value of a remaining time for attainment which
5 is a time taken for a current controlled variable to
6 reach the set point in the follow-up phase, on the basis
7 of a deviation between the set point and the controlled
8 variable and a controlled variable change ratio, and the
9 step of setting a time point, as the start time point of
10 the convergence phase, at which the calculated predicted
11 value of the remaining time for attainment becomes
12 smaller than a preset time index.

5. A feedback control method according to
2 claim 1, characterized in that the third phase switching
3 step comprises the step of setting a time point, as the
4 start time point of the stable phase, at which a preset
5 time index has elapsed.

6. A feedback control method according to
2 claim 1, characterized in that the follow-up phase
3 manipulated variable determination step comprises the
4 step of continuously outputting a preset manipulated
5 variable.

7. A feedback control method according to
2 claim 1, characterized in that the convergence phase
3 manipulated variable determination step comprises the
4 step of continuously outputting a preset manipulated
5 variable.

8. (amended) A feedback control device for

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dividing a

2 response process of disturbance recovery control into
3 three stages including a follow-up phase, a convergence
4 phase, and a stable phase and performing disturbance
5 recovery control by giving a manipulated variable to a
6 controlled system so as to make a controlled variable
7 recover to a set point at the time of application of a
8 disturbance, characterized by comprising:

9 a first phase switching unit which switches to
10 the follow-up phase at a disturbance application
11 detection time point as a start time point of the
12 follow-up phase;

13 a second phase switching unit which switches
14 to the convergence phase at a disturbance recovery
15 control elapsed time point, as a start time point of the
16 convergence phase, at which the controlled variable does
17 not exceed the set point in the follow-up phase;

18 a third phase switching unit which switches to
19 the stable phase at a time point, as a start time point
20 of the stable phase, at which a preset state is reached
21 in the convergence phase;

22 a first manipulated variable determining unit
23 which continuously outputs a manipulated variable which
24 makes the controlled variable follow up the set point in
25 the follow-up phase;

26 a second manipulated variable determining unit
27 which continuously outputs a manipulated variable which

28 makes the controlled variable converge near the set
29 point in the convergence phase so as to prevent a
30 control response waveform from being disturbed before
31 and after a switching time point between the follow-up
32 phase and the stable phase; and
33 a third manipulated variable determining unit
34 continuously outputs a manipulated variable which makes
35 the controlled variable stable at the set point in the
36 stable phase.

9. A feedback control device according to
2 claim 8, characterized in that said first phase
3 switching unit sets a time point, as the start time
4 point of the follow-up phase, at which it is confirmed
5 on the basis of a deviation between a set point and a
6 controlled variable that a disturbance has been applied.

10. A feedback control device according to
2 claim 8, characterized in that said first phase
3 switching unit sets a time point, as the start time
4 point of the follow-up phase, at which a phase switching
5 signal is input from an external unit which notifies
6 application of a disturbance.

11. A feedback control device according to
2 claim 8, characterized in that said second phase
3 switching unit calculates a predicted value of a
4 remaining time for attainment which is a time taken for
5 a current controlled variable to reach the set point in
6 the follow-up phase, on the basis of a deviation between

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7 the set point and the controlled variable and a
8 controlled variable change ratio, and sets a time point,
9 as the start time point of the convergence phase, at
10 which the calculated predicted value of the remaining
11 time for attainment becomes smaller than a preset time
12 index.

12. A feedback control device according to
2 claim 8, characterized in that said third phase
3 switching unit sets a time point, as the start time
4 point of the stable phase, at which a preset time index
5 has elapsed.

13. A feedback control device according to
2 claim 8, characterized in that said manipulated variable
3 determining unit continuously outputs a preset
4 manipulated variable.

14. A feedback control device according to
2 claim 8, characterized in that said second manipulated
3 variable determining unit continuously outputs a preset
4 manipulated variable.